

**JOURNAL OF  
PLASMA PHYSICS**

JOURNAL OF PLASMA PHYSICS exists for the publication of experimental and theoretical research papers on plasma physics and its applications.

EDITOR

DR J. P. DOUGHERTY

*Department of Applied Mathematics and Theoretical Physics, University of Cambridge,  
Silver Street, Cambridge, England*

ASSOCIATE EDITORS

PROF. D. BERSHADER

*Department of Aeronautics and Astronautics,  
Stanford University, Stanford, California 94305, U.S.A.*

PROF. F. D. KAHN

*Department of Astronomy,  
University of Manchester, Manchester 13, England*

PROF. W. B. THOMPSON

*Department of Physics,  
University of California, La Jolla, California 92038, U.S.A.*

Authors wishing to have papers published in the JOURNAL should communicate them to any one of the persons named above, choosing one in their own country where possible.

Authors are urged to ensure that their papers are written clearly and attractively, in order that their work will be readily accessible to readers.

Manuscripts should be typed in double spacing on one side of the paper only with references listed at the end in alphabetical order of authors. Drawings should be done in Indian ink on plain white or transparent paper, and should not be larger than 15 in. by 24 in. Lettering should be shown clearly in pencil for reproduction by the printer, and as far as possible information relating to a figure should be placed in the caption rather than on the figure. A typed list of captions should be provided at the end of the manuscript. Proofs of papers from overseas will usually be despatched to authors by airmail. There is no charge for publication. Authors are entitled to receive 50 offprints of a paper in the JOURNAL free of charge, and additional offprints can be purchased if ordered in advance.

© Cambridge University Press, 1972

For permission to reproduce material from *Journal of Plasma Physics*, please apply to the London or New York office of the Cambridge University Press.

ISI Tear Service, 325 Chestnut Street, Philadelphia, Pennsylvania 19106, U.S.A. is authorized to supply single copies of separate articles for private use only.

JOURNAL OF PLASMA PHYSICS is published once every two months in January, March, May, July, September and November, by Cambridge University Press P.O. Box 92, London NW1 2DB and 32 East 57th Street, New York, N.Y. 10022.

Three parts form a volume. The subscription price of a volume (which includes postage) is £12 net (\$37.50 in the U.S.A.). Single parts cost £5 net (\$15.50 in the U.S.A.) plus postage.

Copies of the journal for subscribers in the United States of America are sent by air to New York to arrive with minimum delay.

Second class postage paid at New York, N.Y.

159

# JOURNAL OF PLASMA PHYSICS

VOLUME 8  
1972

CAMBRIDGE  
AT THE UNIVERSITY PRESS  
1972

PUBLISHED BY  
THE SYNDICS OF THE CAMBRIDGE UNIVERSITY PRESS

Bentley House, 200 Euston Road, London NW1 2DB  
American Branch: 32 East 57th Street, New York, N.Y. 10022

*Printed in Great Britain at the University Printing House, Cambridge*



# CONTENTS TO VOLUME 8

## PART 1 AUGUST 1972

|  |        |
|--|--------|
| Reformulation of quasi-linear theory. A. N. KAUFMAN  | page 1 |
| X-ray fine structure of dense plasma in a co-axial accelerator. W. H. BOSTICK, V. NARDI and W. PRIOR       | 7      |
| Current sheath studies in a co-axial plasma focus gun. S. P. CHOW, S. LEE and B. C. TAN                    | 21     |
| The velocity of a wave packet in an anisotropic absorbing medium. K. SUCHY                                 | 33     |
| Ray tracing in an anisotropic absorbing medium. K. SUCHY   | 53     |
| Diffusion controlled breakdown of gases in a rectangular microwave cavity. D. C. MALDONADO and I. L. AYALA | 67     |
| Hydromagnetic flow about a curved neutral sheet. M. TESKE and S. H. LAM                                    | 77     |
| Ergodic behaviour of nonlinear hydromagnetic waves in a cold collisionless plasma. Y. INOUE and N. KIMURA  | 97     |
| On the stability of nonlinear cold plasma waves. E. INFELD   | 105    |
| REVIEW   |        |
| <i>Shock waves in collisionless plasmas by D. A. Tidman and N. A. Krall</i>                                | 111    |

## PART 2 OCTOBER 1972

|   |     |
|---|-----|
| Nonlinear radio-frequency response of a non-uniform plasma slab-condenser system with realistic density and velocity profiles. R. BAILLIEU, A. M. MESSIAEN and P. E. VANDENPLAS | 113 |
| Comparison of wave propagation in the stationary and moving plasma: motion and wave propagation along the magnetic field. D. N. SRIVASTAVA                                      | 127 |
| The thickness of perpendicular collisionless shocks in a hot plasma. R. A. CAIRNS   | 137 |
| Turbulence in weakly ionized plasma. D. S. BUGNOLO  | 143 |
| Nonlinear stabilization of cold beam-plasma instability. M. R. GUPTA  | 159 |
| Instability of a large-amplitude plasma wave due to inverted trapped particle population. C. S. LIU   | 169 |
| On the nonlinear damping of a plasma mode. R. NANDAN and G. POCOBELLI   | 175 |

|   |          |
|---|----------|
| Short life mode of electrostatic cyclotron waves. H. OYA  | page 183 |
| Plasma heating and acceleration due to Landau damping of hydromagnetic waves. A. BARNES and R. J. HUNG  | 197      |
| Total reflection of a plane wave by a semi-infinite random medium. P. L. SULEM and U. FRISCH  | 217      |
| Electron density and temperature measurements in the lower ionosphere as deduced from the warm plasma theory of the h.f. quadrupole probe. J. M. CHASSERIAUX, R. DEBRIE and C. RENARD | 231      |
| Cyclotron resonance in an inhomogeneous plasma. M. J. LAIRD   | 255      |

## PART 3 DECEMBER 1972

|  |     |
|--|-----|
| Energy absorption in cold inhomogeneous plasmas: the Herlofson paradox. F. W. CRAWFORD and K. J. HARKER  | 261 |
| Characteristics of the electric field far from and close to a radiating antenna around the low hybrid resonance in the ionospheric plasma. C. BEGHIN and R. DEBRIE | 287 |
| Propagation of electronic longitudinal modes in a non-Maxwellian plasma. D. HENRY and J. P. TREGUIER   | 311 |
| Measurement of ion-rich sheath thickness by ion acoustic wave. S. WATANABE, O. ISHIHARA and H. TANACA  | 321 |
| Cylindrically symmetric waves in the magnetohydrodynamic approximation. M. L. WOOLLEY  | 331 |
| Effect of the plasma inhomogeneity on the nonlinear damping of monochromatic waves. E. ASSEO, G. LAVAL, R. PELLAT, R. WELTI and A. ROUX                            | 341 |
| Kinetic theory of a two-dimensional magnetized plasma. Part 2. Balescu-Lenard limit. G. VAHALA   | 357 |
| Kinetic theory of a two-dimensional magnetized plasma. Part 3. Limit of very large magnetic field. G. VAHALA   | 375 |
| Ion cyclotron instability in current-carrying plasmas with anisotropic temperatures. K. F. LEE   | 379 |
| The instability of hydrodynamic longitudinal oscillations in a non-uniform magnetoactive plasma. V. V. DEMCHENKO and I. A. EL-NAGGAR                               | 387 |
| Effects of collisions and gyroviscosity on gravitational instability in a two-component plasma. F. HERRNEGGER  | 393 |
| INDEX TO VOLUME 8  | 401 |